

ARB Quantification Methodology for Strategic Growth Council (SGC) Affordable Housing and Sustainable Communities (AHSC) Program

The California Air Resources Board (ARB) is responsible for providing the quantification methodology to estimate GHG emission reductions from projects receiving monies from the Greenhouse Gas Reduction Fund (GGRF). For the SGC AHSC Program, ARB staff developed the GHG emission reduction quantification methodology to be used by grant applicants to estimate proposed project GHG emission reductions for Fiscal Year (FY) 2014-15 funds. See Appendix D link below.

The AHSC Program funds land-use, housing, transportation, and land preservation projects to support infill and compact development that reduce GHG emissions and benefit disadvantaged communities. The AHSC Program is administered by the SGC with assistance from the Department of Housing and Community Development (HCD). HCD will implement the transportation, housing and infrastructure components of the Program.

For more information on the SGC AHSC Program click [here](#).

AHSC Guidelines

- [SGC AHSC Program Guidelines for FY 2014-15.](#)
 - [Appendix D : Greenhouse Gas Quantification Methodology Version 2 \(Final\).](#)
The quantification methodology has been revised to address frequently asked questions.
Version 2 must be used when quantifying GHG emission reductions for AHSC applications.
 - [Appendix D : Greenhouse Gas Quantification Methodology Version 2 \(track changes\).](#)

Technical Assistance and Tools

For questions about the Quantification Methodology, please email us at GGRFProgram@arb.ca.gov

To help us serve you better, please provide the following information: name and company/industry, contact information, and description of question/comment.

Links to related tools:

- [California Emissions Estimator Model \(CalEEMod\)](#)
 - [CAPCOA Quantifying Greenhouse Gas Mitigation Measures](#)
- [EMFAC2011 Emission Database](#)

FAQS and Examples

Example CalEEMod Evaluation for a Hypothetical SGC AHSC Affordable Housing Integrated Connectivity Project (ICP)

“Rose Garden Residences”, follows the steps detailed in Sections B & D of the Greenhouse Gas Quantification Methodology for the Strategic Growth Council Affordable Housing and Sustainable Communities Program Version 2 (AHSC QM V2). To see example click [here](#).

“Increase Destination Accessibility” (LUT-4) in Step 4 requires the distance to a “job center” or “downtown” for my project. How do I identify the nearest job center/downtown location to determine the distance for my project?

For the projects that were invited to submit a full application and include housing, AHSC program staff will send an individual e-mail with the distance to the nearest “job center”. Applicants must use the distance in LUT-4, Step 4 that is provided for their project. While the distance to the closest “job center” may change over the 30 year project life, the distance provided in the table must be used for Yr1 and YrF in Step 4.

For consistency in GHG reduction evaluations, the input LUT-4 in Step 4 is the distance the closest “job center”. Benefits are achieved for distances closer than 12 miles. For AHSC FY2014-15 applicants, a “job center” is defined as census tract (using 2011 census data (1)) with at least 5,000 jobs/sq mi. The distance to the “job center” is the shortest mileage by auto from the affordable housing development to the closest point on the “job center” perimeter. If the affordable housing development is within a “job center”, the distance is “0” miles.

Background: ARB staff performed a literature review for a definition of “job centers” (also called employment centers) or downtown areas (also called central business districts) both in California and nationally. In the literature reviewed, the definition of a “downtown” was not quantitatively defined, therefore, ARB is narrowing the input to LUT-4 to only include “job center”. In the studies, “job centers” have been identified as having employment densities ranging from a “moderately high density” of about 5,000 jobs/sq mi to “very high density” criteria of up to 22,000 jobs/sq mi.(2,3,4)

To provide a consistent definition for distance to the nearest “job center”, ARB staff selected a “job center” threshold of 5000 jobs/sq mile. This threshold is similar to job center identifications from MTC and SACOG and other studies that use moderately high density thresholds.(5,6)

References:

(1) Census Data available at <http://lehd.did.census.gov/data/> using LODES7 Workplace Area Characteristics data for 2011 (ca_wac_S000_JT00_2011.csv.gz)

(2) Identifying Concentrations of Employment in Metropolitan Areas. Marlay, M. and Gardner, T. Available at <http://www.census.gov/population/www/cen2000/EmploymentClusters-Methods.pdf>

(3) Metropolitan Spatial Trends in Employment and Housing, Giuliano, G., Agarwal, A., and Redfearn, C. 2008. Available at: <http://onlinepubs.trb.org/Onlinepubs/sr/sr298giuliano.pdf>

(4) Transportation Activity Centers for Urban Transportation Analysis. Casello, J. and Smith, T. Available at http://www.seas.upenn.edu/~tesmith/Casello_Paper.pdf

(5) JULY 2007: Regional Employment Center Characteristics map available at <http://gis.mtc.ca.gov/home/motmArchives.html>

(6) SACOG Regional Planning Partnership-Item #7a Attachment - Jobs/Housing Balance, Job Centers and Transportation. Feb. 18, 2015

What if my project includes new rail stops along an existing line?

New rail stops that meet the AHSC Guideline requirements for “Qualifying Transit” are included in the CalEEMod evaluation measures for transit accessibility (LUT-5) and transit improvements (TST-3 and 4).

How should the distance to a central business district or job center be estimated?

The distance to downtown or job center is a VMT reduction measure for auto travel; therefore, distance should represent the shortest mileage achievable by auto.

Does the quantification methodology include programs for students?

The quantification methodology does not include methods that focus solely on student populations; however, students are included in evaluations as “residents” of housing projects (CalEEMod evaluation) and as “bus/van riders, pedestrians or cyclists” (Transit and Connectivity Methods).

Our proposed development does not provide resident parking and we plan to input 100% for the measure “Limit Parking Supply” PDT-1. From the tables listed in the CAPCOA Study for measures PDT-1 and PDT-2, our development would achieve more reductions using “Unbundle Parking Costs from Property Costs” PDT-2. It seems that limiting the parking supply should provide greater GHG reductions.

The reductions are based on empirical literature and will depend on the reduction in parking spaces in “Limit Parking Supply” PDT-1 and the amount of the parking charge in “Unbundle Parking Costs from Property Cost” PDT 2. Instead of using the tables in the CAPCOA Study for comparison, ARB staff recommends comparing both scenarios using CalEEMod. In a CalEEMod comparison by ARB staff, “Limited Parking Supply” LUT-1 at 100% reduction (i.e., no parking spaces) resulted in higher reductions than unbundled parking at \$125 per month.

Please provide more clarity and examples of what types of vehicles are included in CalEEMod’s “Implement a Neighborhood Electric Vehicle (NEV) Network” SDT-3.

CalEEMod's "Implement a NEV Network" SDT-3 only applies to "light" vehicles using NEV networks. The NEV network "light" vehicles are not the same as freeway-rated electric vehicles (such as a Nissan Leaf) or plug in hybrids (such as a Toyota Prius Plug-In Hybrid). NEV network "light" vehicles are classified in the California Vehicle Code Section 385.5 and can only attain a speed between 20 – 25 miles per hour, in one mile on a paved level surface.

How do I determine if pedestrian improvements in CalEEMod's "Improve Pedestrian Network" SDT-1 are "Project Site" or "Project Site and Connecting Off-Site"? For example, would improvements to the sidewalk in front of a development count as "Project Site and Connecting Off-Site"?

In the CAPCOA Study description for SDT-1, linking a project site to external streets or facilities that are contiguous to the project (e.g., to the sidewalk in front of the development) are considered "Project Site" improvements in CalEEMod. Using the same reasoning, linking to contiguous and non-contiguous streets or facilities would be considered improvements to the "Project Site and Connecting Off-Site".

CalEEMod does not allow a retail space larger than 1,000 sq. ft. If my retail space is larger, how do I reflect that in CalEEMod?

In the retail land use type, the unit amount and size metric represent units of measure. In the CalEEMod Land Use screen for the land use type retail-supermarket (i.e., .grocery), the unit amount specifies how many square feet as measured in the size metric of 1000 sq. ft. For example, when the applicant enters 6 in the unit amount, it is multiplied by the size metric of 1000 sq. ft. to provide a single retail space of 6,000 sq. ft.

How do I quantify GHG emission reductions for housing rehabilitation projects?

For housing rehabilitation projects that meet the AHSC Guidelines definition of "Substantial Rehabilitation", CalEEMod should be used to evaluate GHG emission reductions. "Substantial Rehabilitation" projects will be evaluated for GHG reductions in the same manner as a new housing development. The applicant will use CalEEMod steps 1-6 as detailed in the AHSC Quantification Methodology. For "Substantial Rehabilitation", see AHSC Guidelines Affordable Housing Development Capital Projects (page 11) and definition of "Substantial Rehabilitation" (page A-8).

How do I quantify GHG emission reductions for preservation of at-risk affordable housing?

To the extent that GGRF monies are used to preserve affordable units where subsidy contracts or regulatory agreements are expiring, GHG emission reductions should be quantified using CalEEMod. The applicant will use the measure "Integrate Below Market Rate Housing" LUT-6 as described in AHSC Quantification Methodology to quantify the benefits of preserving the affordable units. Note that the assumption for using LUT-6 is that without the AHSC project, the affordable units will be lost (i.e., converted to market rate); therefore, the initial case assumes no affordable units. The project case represents maintaining the existing affordable units under the

proposed preservation project. For “preservation of housing affordability at-risk of conversion to market rate” see AHSC Guidelines Page 11, Affordable Housing Development Capital Projects.

Please provide a definition of a transit station for LUT-5 “Increase Transit Accessibility”. Can it be a transit station or a transit stop? Is there a required level of service? Is 0 mile a valid CalEEMod input for developments that are next to a transit stop/station?

For LUT-5 “Increase Transit Accessibility”, the transit service can be bus or rail and can include either a station or a stop. For TODs (i.e., high quality transit requirement), the qualifying transit must have peak period headway frequencies at or less than 15 minutes. For ICPs (i.e., non-high quality transit requirement), the level of service requirements are peak period headway frequencies greater than 15 minutes and less than 75 minutes. An input of 0 miles for “Distance to Transit” LUT-5 is a valid input for a land use project (e.g., housing development) that shares a boundary with the qualifying transit. For LUT-5, CalEEMod accepts both whole (e.g. 2 miles) and decimal numbers (e.g., 0.2 miles).

In CalEEMod, can I take credit for “Increase Diversity” [LUT-3] as mitigation measure if my proposed project is near different land use types? My project is “Substantial Rehabilitation” of existing housing units.

CalEEMod’s “Increase Diversity” evaluates the mix of land types that are included in the project. For example, an affordable housing project does not provide diversity-related reductions since the project only includes one land use type (i.e., residential). A mixed use project that includes affordable housing and retail would provide diversity-related reductions since the project includes two land use types (i.e., residential and retail). For additional information on how to quantify “Substantial Rehabilitation” projects using CalEEMod, see FAQ “How do I quantify GHG emission reductions for housing rehabilitation projects?”

In CalEEMod’s “Implement Market Priced Public Parking” PDT-3, what is the baseline parking price for “% increase in price”?

Neither CalEEMod nor the CAPCOA Study provides a baseline public parking price. For the SGC AHSC program, the baseline for the “percent increase in price” should be determined by the applicant using the average public parking cost prior to the price increase in the area within the housing development (if it contains public parking) and surrounding area.

Note: These metrics should be evaluated for an area within the housing development and surrounding area which can extend a distance (d) from the housing development not to exceed one-half ($\frac{1}{2}$) mile.

What is the unit for Auto Fleet Average Running Factor (AREF) in the AHSC QM Version 2, Step 2 on Page 22? In the AREF calculation, should CO2_STREX (Pavley I+LCFS) in grams/vehicle/day or CO2_RUNEX (Pavley I+LCFS) in grams/mile be used?

Applicants should use the EMFAC2011 emission factors for CO2_RUNEX (Pavley I+LCFS) in grams/mile when calculating the Auto Fleet Average Running Factor (AREF).

In Step 2 on page 22 there is a typographical error.

The unit for Auto Fleet Average Running Factor (AREF) is reported in: **grams/vehicle/day**

The unit for Auto Fleet Average Running Factor (AREF) should be reported in: **grams/mile**

In CalEEMod's "Improve Walkability Design" LUT-9, what types of intersection should be considered (e.g., three-way or four-way) when determining the number of "intersections per square mile"?

CalEEMod's "Improve Walkability Design" LUT-9 evaluates improved street network characteristics and accessibility for enhanced walkability within a neighborhood. All types of auto-oriented or pedestrian intersections can be considered when determining the input for the number of "intersections per square mile."

Is it correct that none of the CalEEMod "Traffic Mitigation Commute" measures can be used for residents of housing project with the exception of "Transit Passes for Residents" TRT-4 added in Step 4? Can "Implement Trip Reduction Program" TRT 1 & 2 and "Market Commute Trip Reduction Option" TRT-7 be used for residents?

Yes, in CalEEMod, the "Traffic Mitigation Commute Measures", which include TRT-1 & 2 and TRT-7, only apply to land uses with employees (with the exception of School Bus Programs); they do not apply to residential land uses. A method is included in Step 4 of the Quantification Methodology Version 2 to quantify the benefits of transit pass programs for housing residents.

Applicants may use the methodologies referred to as "Transit and Connectivity (TAC) Methods" in the Quantification Methodology Version 2 to quantify additional benefits for eligible projects, such as vanpools and shuttles.

For GHG reduction quantification, can the CalEEMod or TAC modeling include elements of the project beyond what is included in the application, such as future phases (e.g., future phases of an affordable housing development) or neighborhood improvements from other projects (e.g., traffic calming measures funded by another agency), or is it restricted to just those elements included in the application for the proposed AHSC project?

When calculating GHG reduction estimates using CalEEMod or TAC methods, the applicant must only include the portion, or phase, of the project that is included in the proposed AHSC project. In addition, only existing neighborhood conditions may be included; improvements from other neighborhood projects that are not part of the proposed AHSC project may not be included in the GHG reduction estimates. Measures funded outside the proposed AHSC project may be eligible to receive additional points in the overall scoring; applicants should refer to the SGC Guidelines, pages 29-42, for information on scoring elements and criteria.

For CalEEMod’s “Provide Traffic Calming Measures” SDT-2, are the inputs determined for adjacent project streets or all streets within the “surrounding area” as identified in Note (a) page 7 of the Quantification Methodology Version 2?

The area used to evaluate the inputs for SDT-2, and other measures noted in Quantification Methodology Version 2 Table 3, Note (a), is up to the applicant to define within the surrounding area. The area can range from the area of the housing development to an area with distance of up to ½ mile. Note that the area does not have to be circular.

In CalEEMod, do I need to put a parking lot as a separate land use type in the “Land Use” screen in addition to “Apartments Low Rise” when modeling GHG emission reductions?

No, CalEEMod incorporates parking for residential land uses in the lot acreage footprint; therefore, a separate parking land use does not need to be identified. For more information on how CalEEMod treats parking based on the footprint and lot acreage of residential and non-residential land uses, please refer to CalEEMod user guide pages 14-16.

For CalEEMod’s “Improve Walkability Design” LUT-9, should the area used to determine the input “intersections per square mile” be defined as a circular area with radius equal to the distance to transit?

The area used to evaluate the inputs for LUT-9, and other measures noted in Quantification Methodology Version 2 Table 3, Note (a), is up to the applicant to define within the surrounding area. The area can range from the area of the housing development to an area with distance of up to ½ mile. Note that the area does not have to be circular.

As listed in Quantification Methodology, the applicant is required to provide GHG reduction benefits as follows: Metric tons (MT) of CO₂ over the project life / GGRF Funds Requested (\$)

Is it correct that the results can be a small value, in the range of 0.0002 MT CO₂ per GGRF Funds Requested (\$)?

Yes. The reporting metric specified is correct and can result in small values due to the units specified, the estimated reductions, and the funding requested.

The mitigation measure "Implement Car-Sharing Program" TRT-9 in the CAPCOA study doesn’t appear in CalEEMod or in the Quantification Methodology V2. Can TRT-9 be used as a mitigation measure?

TRT-9 cannot be quantified as a mitigation measure; however, it may be eligible to receive additional points in the overall scoring. CalEEMod only includes a subset of the traffic mitigation measures identified in the CAPCOA study. For FY 2014-15, the impact from “Implement Car-Sharing Program” TRT-9 is not part of the Quantification Methodology Version 2. Applicants should refer to the SGC Guidelines, pages 29-42, for information on scoring elements and criteria.

Are roundabouts considered a GHG mitigation measure? If so, how should we quantify the reductions? Do roundabouts provide significant GHG reductions?

Yes, in CalEEMod's "Provide Traffic Calming Measures" SDT-2, roundabouts qualify as traffic calming measure. SDT-2 can provide up to 1% decrease in GHGs.

In CalEEMod's "Provide Traffic Calming Measures" SDT-2 what are the inputs and over what area are the improvements evaluated?

The inputs for CalEEMod's "Provide Traffic Calming Measures" SDT-2 are "% of streets with improvements" and "% of intersections with improvements". There must be improvements to at least 25 percent of the streets and intersections within the surrounding area to qualify under SDT-2. For example, if the surrounding area includes four intersections and six streets, at least one intersection (1/4) and two streets (2/6) would need to be improved to use SDT-2. The improvements are evaluated for an area within and surrounding the project as described in the Quantification Methodology Version 2 Table 3, Note (a).

How do I determine the subsidy or discount per year for "Transit Subsidy for Residents" in Step 4? What happens if the discount/subsidy is less than \$237.75?

The subsidy/discount is the difference between the amount per year that the resident will pay with and without the subsidy/discount. If the subsidy/discount is less than \$273.75 per year, the impacts from "Transit Subsidy for Residents" in Step 4 cannot be quantified.